Using Conformance Checking to Promote Societal Implementation of Research and Development Technology

Investigation of How Conformance Checking Can Enable Unprecedentedly Effective and Rapid Societal Implementation

Features

1. Research and develop approaches to conformance checking which take advantage of Japan's strengths and foster international standardization
2. Investigate realistic methods of incorporating security into critical infrastructure which contains a mix of old and new Develop conformance checking tools which promote the reliable incorporation of security

Related technical fields:
- Requirement analysis, security and safety integration building support tools, etc.

Collaborating industries:
- Information and communications broadcasting; transportation, energy and other critical infrastructure projects

Research Aims

The push to incorporate cutting-edge IT into established infrastructure is rapidly picking up momentum. The existing safe and advanced functional technologies and operating methods characteristic of Japan and cultivated from physical control systems will continue to be utilized, while the positive elements of IT security technology and systems from overseas will be appropriately incorporated. Towards this end, investigation will be undertaken into effective security standardization technologies and conformance checking mechanism. Initially, the focus will be on finding applications in the three fields of information and communications broadcasting, transportation and energy, after which the scope of application will be widened. The target schedule of this undertaking will begin with outline strategy creation, followed by standardization preparation, various tool development, concept verification, after which will be international standardization in FY 2019, application in the 2020 Tokyo Olympics and then widespread adoption as a TOP framework.

Content of Research

[Core Technology]
1. SIP Development Technology
   - Authenticity Verification etc.
2. AIST Development Technology
   (AIST: National Institute of Advanced Industrial Science and Technology)
   - Requirement Analysis Technology
   - Safety & Security Integrated Analysis Technology

[Global Trends]
- Government Agencies etc.

[Societal Implementation Technology]
- Realization of Cybersecurity Over the Entire Life Cycle

- Security by Design (Current Research)

- Specification and Guideline Creation

- Conformance Checking
  - Structure and Operation
  - Technical Specifications, Technical Implementations

- Technical Standards, Operation Manual

Schedule

<table>
<thead>
<tr>
<th></th>
<th>2015～2019</th>
<th>2020～2024</th>
<th>2025～2029</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformance checking</td>
<td></td>
<td>Energy, Transportation, Tele-communications</td>
<td>Critical Infrastructure (and others)</td>
</tr>
<tr>
<td>Mechanism and Societal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Investigation and</td>
<td>Standardization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conformance Checking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools (Technical research)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey of Current Status and Trends</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conformance checking</td>
<td>Requirements Investigation</td>
<td>Tool Usage guide</td>
<td>Consultation and Tool Utilization Business</td>
</tr>
<tr>
<td>mechanism investigation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prototype Development</td>
<td>Trial Use and Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing certification bodies go to TOP framework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System design/Scheme Refinement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOP: Trusted Operational Platform for Cybersecurity
(1) Requirement Analysis: High-Precision Automation

- Security requirements (from several hundreds to thousands)

- International standards, domestic standards, in-house standards

- Matching

- Huge cost when done by hand

- Verifiable by hand

(2) Safety & Security Integrated Analysis

Conformance Checking Support Tools
- "Case creation is expensive and develops leaks easily"
- "Tools which semi-automate "case creation" based on GSN diagrams for the checking target and the "case" template.
- "Used with multiple targets, and brings down overall cost."

- Requirement Analysis Support Framework (Method Integration)
  - Hazard and threat analysis
  - Risk assessment
  - Safety and security requirements etc.

- GSN diagram for conformance checking target

Global Reality of and Japanese Ideal for Conformance Checking

(3) Current State of Standardization

Currently extending standards from information systems to control systems

(4) Conformance Checking System for Critical Infrastructure (Electrical)

Electric power sector leading the way on combining legal regulations and provider measures

(5) Japanese Ideal

- Existing standardization technologies, conformance checking methods
- Suggest new mechanisms to deal with security threats
- Utilize (1), (2)
- Existing standardization technologies, conformance checking methods
- Develop and apply new standardization technologies, conformance checking methods
- Satisfactory solution achieved?
- Yes
- Promote standardization, commercialization
- Refer to (3), (4)
  - Design around mixed-type (CPS-oriented)
  - Appropriately incorporate exemplary technologies and systems from overseas

- Legislative refinement
- Follow manuals on-site
- Government penalties of violations

- Guideline refinement
- Follow manuals on-site
- Violations result in damage

- Basic Law + Guidelines
- On-site rigor is expected
- In-house/industry regulations
- Self-regulation failure results in societal criticism

- Legislative refinement
- Follow manuals on-site
- Government penalties of violations

- Guideline refinement
- Follow manuals on-site
- Violations result in damage

- Basic Law + Guidelines
- On-site rigor is expected
- In-house/industry regulations
- Self-regulation failure results in societal criticism